PATENT SPECIFICATION (11) 1 211 855

DRAWINGS ATTACHED

1 211 855

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(54) IMPROVEMENTS IN OR RELATING TO INTERNAL COMBUSTION ENGINES

(71) I, JAGDISH RAJ CHHABRA, an Indian national, of Police Training College, Northern Zone, Phillaur, India, formerly of 2A, Baradari Gardens, Patiala, India, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to internal combustion engines, of the general type having one or more than one combustion chamber (for instance a cylinder of a piston and cylinder engine); means for supplying air to the combustion chamber; means for producing finely divided liquid fuel from a supply of liquid fuel, and means for mixing the finely divided fuel with the air to produce a fuel/air mixture (for example one or more than one carburettor); and passage means (for example an induction manifold) for conveying the fuel/air mixture to the or each combustion chamber.

For many years there has existed the problem, in an engine of this general type, of improving fuel consumption, either by reducing fuel consumption for a given power output, or by increasing power output for a given fuel consumption, or both. Other desirable requirements that have long been sought are to improve the starting of the engine and to reduce wear of the engine.

More recently there has been recognised the problem of reducing the quantity of harmful constituents in the exhaust gases of the engine, and particularly the need for reducing emission of carbon monoxide and unburnt hydrocarbons.

It is therefore an object of this invention to provide a solution as far as practicable, to these problems, and in particular to provide an engine in which good fuel consumption is combined with acceptable levels of emission of carbon monoxide and unburnt hydrocarbons.

According to this invention an internal combustion engine comprises:—

at least one combustion chamber;

means for supplying air to the combustion chamber;

means for producing finely divided liquid fuel from a supply of liquid fuel;

means for mixing the finely divided fuel with the air to produce a fuel/air mixture; and

passage means for conveying the fuel/air mixture to the combustion chamber or chambers,

characterized in that a perforated diffusing screen for diffusing the fuel/air mixture is disposed in the passage means, the screen being movable between a first position, in which the screen extends across the passage means so that the fuel/air mixture must pass through substantially the whole area of the perforated screen, and a second position in which the screen presents little obstruction to the fuel/air mixture;

and further characterized in that the screen comprises generally flat, spaced apart, first and second perforated parts, the first part in the said first position extending over substantially the whole cross section of the passage means in a direction substantially normal to the flow of fuel/air mixture and the second part extending across not more than substantially half the said cross section.

The screen is preferably circular and rockably mounted on pivot means whose axis is at right angles to the axis of the passage means at the location of the screen therein. The pivot means may be a tube which extends across the passage means and on which the screen is rockably carried. The circular screen is preferably made up of a perforated circular disc and a perforated semi-circular plate, the disc and the plate being spaced from one another and substantially parallel. The screen is preferably automatically returnable to the first position, for example by a weight fixed to the edge of the screen. The pivot tube may be heated so as to heat the fuel/air mixture, and further it may be heated by being con-

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nected to the exhaust system of the engine.

The screen is preferably disposed in the induction manifold of the engine at the location where a carburettor is connected to the induction manifold. It is desirable that, downstream of the screen, the wall of the passage means should be provided with means, for instance a shaped wire mesh sleeve, to prevent liquid fuel running along the wall.

The invention will now be described in more detail by way of example, with reference to the accompanying drawings in which:—

Figure 1 is a purely diagrammatic side elevation of an internal combustion engine;

Figures 2 and 3 are enlarged details of Figure 1;

Figure 4 is an enlarged detail section on plane 4—4 of Figure 1;

Figures 5 and 6 are respectively a side elevation and plan of a clamping plate;

Figure 7 is a plan view, partly broken away, of a diffusing screen;

Figure 8 is a section on plane 8—8 of Figure 7; and

Figure 9 is an elevation of a wire mesh tube.

Referring to Figure 1, an internal combustion engine is shown having an induction manifold 1, a carburettor 2, an exhaust manifold 3, an exhaust pipe 4, and tubes 5 and 6 for conveying hot exhaust gas respectively to and from an extension 1A of the induction manifold 1.

Figure 2 shows the connection of the tube 5 to the exhaust pipe 4 at a brazed joint 5A. The tube 5 extends into the interior of the pipe 4 as indicated in dotted lines, its end being as shown of scoop-like form 5B, to ensure that hot exhaust gas enters the tube 5.

Figure 3 shows the connection of the tube 6 to the exhaust pipe 4 at a brazed joint 6A. The tube 6 extends into the interior of the pipe 4 as indicated in dotted lines, its end being as shown of scoop-like form 6B, to assist return of exhaust gas to the pipe 4.

The tubes 5 and 6 are connected respectively to each end of a tube 11 which extends throught the extension 1A, as will be described. The purpose of the above-described arrangement for diverting some of the hot exhaust gas is to provide for heating the fuel/air mixture leaving the carburettor 2.

Referring to Figure 4 a heat resistant packing 7 and a tube clamping plate 8 are fixed by bolts (not shown) between the extension 1A of the induction manifold 1 and the lower end flange 2A of the carburettor 2. Airtightness is ensured by gaskets 9. The induction manifold 1 communicates with the carburettor 2 by means of the extension 1A, which is in the form of a curved passage 10 and forms part of the manifold 1.

Partly in the passage 10 and in bore 8A of plate 8 is loosely fitted a shaped tube 12 of wire mesh, for example of 30×30 copper mesh. This tube 12 is seen in Figure 9; it has a locating flange 12A which fits in, and is retained by, an annular groove 12B between the packing 7 and clamping plate 8. This tube 12 prevents fuel collecting on and running along the wall of the curved passage 10.

Transversely and diametrally of the passage 10 and bore 8A the tube 11 is fitted; it is received in a pair of aligned, semi-circular grooves (not shown) in the outer face of the induction manifold casting and also in like grooves 13 in the plate 8 (see Figures 5 and 6); thus the plate 8 clamps the tube 11 in the two sets of grooves, so that it extends across the flow path of fuel/air mixture from the carburettor 2 to the induction manifold 1.

Rockably mounted on the tube 11 is a perforated diffuser screen 14, in the form of a butterfly. This screen includes a pair of spaced rings 14A (Figure 7) which encircle the tube 11 freely, to permit rocking thereon of the screen 14. The perforated screen 14 is made up of two plates 15, 16 of copper wire mesh; plate 15 is upstream (in the direction of fuel/air mixture flow) and is circular (see Figure 7). In the closed state shown in Figure 4, it extends across the area of flow. Plate 16 is substantially semi-circular and is downstream of plate 15 extending across approximately half the area of flow in the Figure 4 state. Figures 7 and 8 show the construction of the screen 14. The tube 12 has opposed holes 12C (Figure 9) through which pass the tube 11. The screen 14 has a lead weight 17 fixed to the lower edge, as shown.

Referring again to Figure 4, when the engine is running, fuel/air mixture passing from the carburettor 2 to the manifold 1 encounters the resistance of the perforated butterfly diffusing screen 14. The construction of the screen 14 is such that it provides a generally semicircular, single mesh part 16A (Figure 8) and a generally semicircular, double mesh part 15A. The part 15A thus offers greater resistance to the flow, and, according to the speed of flow, the screen 14 is rocked about the axis of the tube 11, to a greater or less degree, from the Figure 4 position towards a fully open position in which the screen is substantially parallel to the axis of the bore 8A. Thus the area of obstruction caused by the screen 14 can vary according to the speed of flow. The purpose of the weight 17 is to ensure positive return of the screen 14 to the Figure 4 position.

The screen 14 is operative in the Figure

4 position to diffuse the fuel by breaking up the fine fuel droplets when the engine is running slowly; as engine speed increases combustion improves and the need for diffusion is reduced and under these conditions the area of the screen 14, as seen in the direction of flow, is reduced.

If desired a pre-heater coil (not shown) can be arranged round the pipe 11 outside the induction manifold; by this means the advantageous effect of heating the pipe 11 may be obtained before the engine has warmed up.

Although in the embodiment described above a packing 7 and a clamping plate 8 are used, it would be possible to dispense with the plate 8 and the two sets of grooves which receive the pipe 11. Instead, the packing 7 could be thicker and could be bored to receive, and retain the pipe 11. It is necessary to ensure that the butterfly diffusing screen 14 does not foul the throttle butterfly of the carburettor, but on the other hand it is possible to arrange the two butterflies so that in the fully open throttle position they touch; in this state the throttle butterfly acts as a stop for the butterfly screen and prevents flutter of the latter. Alternatively a separate stop could be provided for this purpose.

The tube 12 is shown as of mesh; this is preferred, but a tube of imperforate sheet material could be used.

The diffusing screen 14 may be adapted for use with various kinds of induction manifold and various kinds of carburettor in an internal combustion engine according to the invention. It could also be used with an internal combustion engine having fuel injection into an air inlet passage.

WHAT I CLAIM IS:—

1. An internal combustion engine comprising:—

at least one combustion chamber;

means for supplying air to the combustion chamber;

means for producing finely divided liquid fuel from a supply of liquid fuel;

means for mixing the finely divided fuel with the air to produce a fuel/air mixture; and

passage means for conveying the fuel/air mixture to the combustion chamber or chambers,

characterized in that a perforated diffusing screen for diffusing the fuel/air mixture is disposed in the passage means, the screen being movable between a first position, in which the screen extends across the passage means so that the fuel/air mixture must pass through substantially the whole area of the perforated screen, and a second position in which the screen presents little obstruction to the fuel/air mixture;

and further characterized in that the screen comprises generally flat, spaced apart, first and second perforated parts, the first part in the said first position extending over substantially the whole cross section of the passage means in a direction substantially normal to the flow of fuel/air mixture and the second part extending across not more than substantially half the said cross section.

2. An engine according to claim 1 characterized in that the screen is rockably mounted on pivot means whose axis is at right angles to the axis of the passage means at the location of the screen therein.

3. An engine according to claim 1 characterized in that the screen is freely rockably mounted on a pivot tube extending across the passage means.

4. An engine according to claim 1 charcterized in that the screen is circular and comprises a perforated circular disc with a perforated semi-circular plate spaced therefrom and substantialy parallel thereto.

5. An engine according to claim 1 characterized in that means are provided for returning the screen to the said first position.

6. An engine according to claim 3 characterized in that the tube is heated.

7. An engine according to claim 1 characterized in that the screen is disposed in an induction manifold of the engine at a location where a carburettor is connected to the induction manifold.

8. An engine according to claim 6 characterized in that the tube is connected in the engine exhaust system whereby hot exhaust gas is passed through the tube to heat the fuel/air mixture in the passage means.

9. An engine according to claim 5 characterized in that the said means for returning the screen comprises a weight fixed at the edge of the screen.

10. An engine according to claim 1 characterized in that downstream of the screen the wall of the passage means is provided with means to prevent liquid fuel running along the wall.

11. An internal combustion engine substantially as herein described, with reference to the accompanying drawings.

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1211855 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

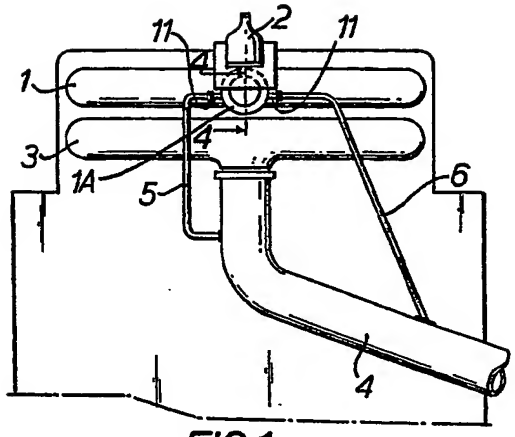


FIG.1.

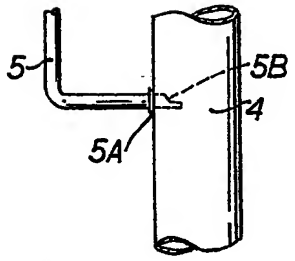


FIG.2.

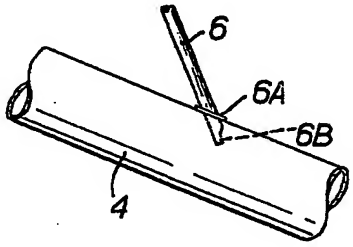


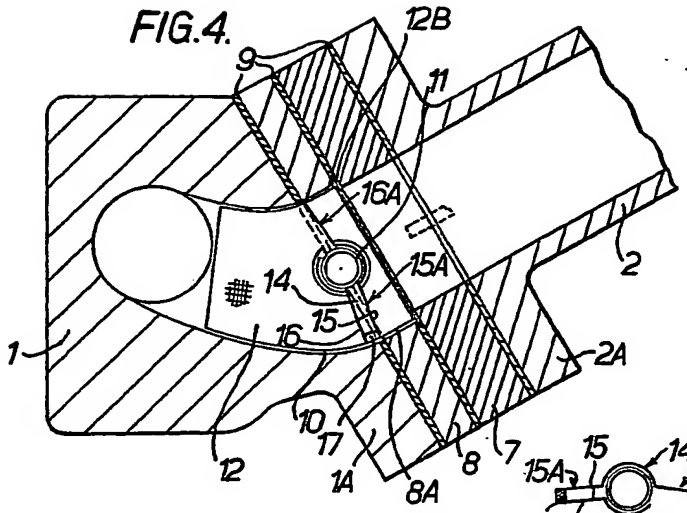
FIG.3.

1211855 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 2

FIG.4.



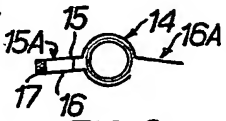


FIG.8.

FIG.5.

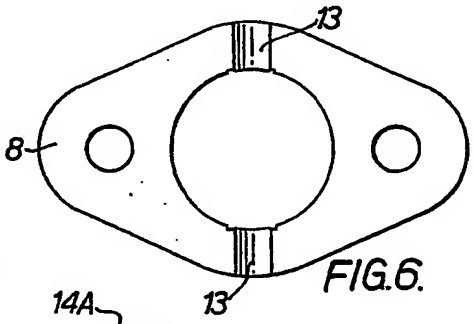


FIG.6.

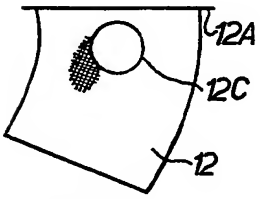


FIG.9.

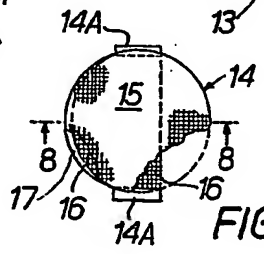


FIG. 7.